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FIRE-FIGHTING EQUIPMENT AND ORGANIZATION OF THE MADISON COAL CORPORATION, GLEN CARBON, MADISON COUNTY, ILLINOIS

BY

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FIRE FIGHTING EQUIPMENT AND ORGANIZATION OF THE MADISON COAL CORPORATION GLEN CARBON, MADISON COUNTY, ILL.[1]

By A. U. Miller[2]

Protection against fire is a greater problem at a coal mine than at an ordinary industrial plant. Generally mines are located in isolated districts and do not have the protection of city fire departments; consequently fire fighting equipment must be installed by the mining company.

Fire protection around a mine is just as essential as it is in the city, and undoubtedly is more important if the fire should be underground where many lives would be endangered and all means of escape cut off. A surface fire can generally be attacked from any angle, but an underground fire can be attacked only as conditions will permit.

U. S. Bureau of Mines engineers have investigated many serious mine fires that undoubtedly could have been extinguished in incipiency if a fire extinguisher or fire hose and water had been readily available.

In past years very little attention was given to fire fighting equipment and organization around mines, but in recent years there has been a decided change of opinion among many of those engaged in mining, and nearly all up-to-date mining companies now have some kind of fire protection about their mines.

Probably the first company in Illinois to install regular fire fighting equipment and effect a fire fighting organization at its mines, was the Madison Coal Corporation, which operates several mines in Illinois. The main office of this company is in Chicago and the general field office is at Glen Carbon, Ill.

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1 The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular 6323."

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Surface Fire Protection

In 1900 the Madison Coal Corporation installed surface fire hydrants, hand-controlled sprinkling systems, and chemical fire extinguishers. The main pipe lines leading from the pump room to the hydrants were small and the hydrants were of homemade construction, consisting of a pipe connected to the main line which extended a few inches above the ground and equipped with a valve and hose connection. These hydrants were enclosed in a small house that also contained a 50-foot reel of hose. Compared with the present-day installations, this equipment is somewhat antiquated; nevertheless the records of the company show that it justified its installation on several occasions.

At the present time the company, as a rule, uses a 6-inch water line and never less than a 4-inch line. Old-style hydrants have been replaced with the modern self-draining type which prevents freezing. Each hydrant is covered with a house about 4 feet square, which is provided with a wide door. In this house are kept hose lines, the length of which depends upon the distance the buildings are from the hydrant; but at no time are there less than two 50-foot lengths of 3-inch hose, provided with nozzle and fittings. Hose wrenches are kept in each station. These wrenches are fastened to the station with a chain so that they will be available if it is necessary to turn on the water.

The hydrants are placed so that they will serve to the best advantage. Generally, there are two rows of fire stations the full length of the mine yard, and so located that at least two and sometimes four and five, streams of water can be thrown on one building.

Where the tipples are not of fireproof construction, there are also sprinkling systems located in different parts of the structure and controlled by a valve on the outside. With this arrangement the upper parts of the tipple can be flooded with water, and several times it has proved very effective. The sprinkling systems are also installed in fan buildings that are not of fireproof construction. Generally the water pressure is obtained from a special steam pump which is located in the main power plant, but in some cases the pump has been supplemented with an electrically driven pump. Other pumps are also arranged so that they can supply water to the fire lines if necessary. The experience of the company has convinced them that a separate pump for the fire lines is the best arrangement. Pumps are capable of carrying a pressure of 275 pounds, which is sufficient to throw two heavy streams of water over the highest tipples and throw four or five streams on any building of ordinary height.

In addition to the water lines there is a 50-gallon chemical fire engine, with which is a hosecart and ten 50-foot lengths of hose. In each building are also placed buckets of water and 3, 5, and 10 gallon fire extinguishers, which are located throughout the different buildings in proportion to floor space as recommended by the insurance companies. A number corresponding to the number of the station where it belongs is placed on the fire extinguisher. The stations consist of a shelf so constructed that it will hold the extinguisher securely and

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placed at a height so that the extinguisher can easily be obtained when needed. The extinguishers are inspected regularly and are discharged and recharged every three months; the dates of recharging are placed on a tag which is attached to the extinguisher. This work is one of the special duties of a designated employee, and he is held responsible for the condition of the extinguishers. A record is kept in a book provided for this purpose and is checked at regular intervals by the superintendent and by a member of the safety department.

Fire drills are held at least once every week. No particular time is set for the drills and the employees seldom know whether the fire alarm means a practice drill or a real fire. Every employee knows his particular duty and how to perform it.

When a fire occurs, or the officials wish to have a fire drill, the employees are notified by a siren. At the first sound the hoisting engineer remains at his post and prepares for the emergency; the head fireman upon receiving the signal starts the fire pump; the head machinist and generator attendant proceed to the pump room to oversee the pumps; the employee whose regular duty is to bell the cage at the ground landing while lowering and hoisting men at starting and quitting time, takes his position at the ground landing; if there are loaded cars on the cages they are dumped, the empty cars are taken off and the man cage is brought to the ground landing; the men at the blacksmith and car-repair shops handle the hose at the hydrants, while the men from the tipple and yards secure their designated fire extinguishers and line up in front of the buildings so that the outside foreman or some other official may direct them, if necessary.

On several occasions these fire drills have been witnessed, and invariably the organization functions with precision. On one such demonstration without any possibility of prearrangement, in 26 seconds after the siren first sounded, the workmen had quit their regular work, proceeded to their respective positions, and the writer counted six streams of water that were being thrown on different buildings. In addition to the hose lines the workmen had many fire extinguishers ready for immediate use.

All fire extinguishers are numbered and assigned to certain employees, underground as well as on the surface, who are responsible for their care as well as their use. All employees have certain specific duties to perform in case of fire and at the fire call no confusion prevails, either underground or on the surface. To prevent dangerous stampeding, certain supervising officers are stationed at prearranged points to give assurance and direct the miners to safe routes to the shaft bottom.

The records of the company show that the fire fighting organization and equipment is more than an organization for display purposes. Several times when there have been fires at different plants operated by the company, the amount saved by the fire organization has abundantly justified its installation and maintenance.

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In 1929 a fire occurred at the company's Mine No. 12, which is located about 1½ miles north of Cambria, Williamson County, Ill. This fire started in the weigh room near the top of the tipple. The fire was discovered about 6 p.m. when only a few men were on duty. The wooden frame and roof of the weigh office, together with the contents of the office, made a very hot blaze, which might have caused the steel of the tipple to twist and thereby brought about considerable property loss; but the sprinkler system was turned on, the tipple flooded, and with two hose lines throwing water on it, the fire was quickly extinguished.

On Friday, August 22, 1924, a fire started about 2 a.m. in the wooden tipple of Mine No. 9, which is located at Colp, Williamson County, Ill. This tipple is an old structure, soaked with oil thrown from the sheave wheels and hoisting rope and was very dry, as there had been very little rain in the vicinity for six weeks prior to the fire.

When the fire was discovered there were only four men on duty. These men sounded the fire alarm, started the pump, set the sprinkler system in operation, and had three streams of water from hose lines playing on the fire within 15 minutes. In a short while additional help arrived on the scene, and within one hour the fire was extinguished.

As many of the heavy timbers near the sheave wheels were yellow pine and well soaked with oil from the sheave wheels and hoisting ropes, the heat was very intense and the fire was difficult to extinguish. Both hoisting ropes were burned in two, which permitted both cages to fall to the bottom of the shaft. However, the fire was extinguished before either sheave wheel dropped. After the fire the sheave wheels were used in hoisting the cage to the ground landing and did not have to be replaced. Had it not been for the available fire fighting equipment which enabled them to control the fire promptly, there is no question that the tipple would have been completely destroyed. This fire occurred at the peak of a busy season, and had the tipple been destroyed it would have necessitated the construction of a new steel tipple, the cost of which would have been considerably more than the total cost for the installation and maintenance of the fire fighting equipment at all of the properties operated by the company. To the cost of a new steel tipple there would be added the loss of profit from the curtailed tonnage and possibly permanent loss of some business. As a result of the fire fighting equipment and organization, the fire was confined to a comparatively small area, and permanent repairs were completed and the mine hoisting coal within 12 days.

Underground Fire Protection

The Madison Coal Corporation also considers it important to have equipment and organization in case of fires and explosions underground. At each mine the company maintains a fully equipped mine rescue station which contains a large room for lectures and practice work, wash room, lockers, and a room for equipment and supplies. Each station is equipped with five complete sets of self-contained breathing apparatus and necessary accessories and supplies, five up-to-date gas masks, one carbon-monoxide detector, six permissible electric cap lamps, one

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cabinet for testing flame safety lamps, one pyrotannic acid outfit for the determination of small percentages of carbon monoxide, one inhaler, one sling psychrometer, one dust collecting outfit and volumeter for the determination of the incombustible content of dust from rock-dusted areas, a life line one thousand feet long, one dozen approved flame safety lamps, one stretcher, one portable gas-analysis apparatus, and an abundance of assorted first-aid material, including regular army stretchers.

The shaft bottom is equipped with a 2-inch water line which is provided with valves and suitable lengths of hose at intervals of 60 feet, and an automatic perforated pipe sprinkler system. In addition to the water lines there are many fire extinguishers located in different places around the shaft bottom such as the locomotive barn, office, waiting places for men, and along the empty and loaded tracks. These extinguishers are placed in concrete-lined stations that have been cut into the rib. All of these stations and extinguishers are numbered in accordance with the method in use for those on the surface. Where mule stables are maintained, these are also equipped with automatic sprinklers and perforated pipe sprinklers which are controlled by valves on the surface. Inside the mine there are fire stations at each pair of cross entries.

As Mines Nos. 9 and 12 "make" considerable water, nearly every entry is equipped with a pipe line. These pipe lines are provided with water taps at regular intervals, and in case of fire in any section of the mine, the pumps can be utilized to furnish the water supply. This is accomplished by closing the main discharge line of the pump and valves leading to other sections of the mine and then pumping the water to the fire area. To prevent the pump pressure from bursting the hose lines, a by-pass pipe with a suitable pressure valve is used near the pump and permits part of the water to return to the sump from which it is being pumped, instead of forcing the total pump discharge through the hose line.

The company has also found rock-dust very valuable in fighting underground fires whenever it is possible to fight them directly. In the mines they have rock-dusted, they keep the rock-dusting machine in readiness at all times, as well as sacks of rock-dust in suitable places in each section.

There is a special room provided near the shaft bottom which contains a 40-gallon chemical fire extinguisher and two mine rescue cars. The track leading to this room is never permitted to be blocked and conditions must be such that a locomotive can hook up to the fire extinguisher or cars at any time, if necessary.

Each car is fully equipped with all of the tools and small supplies that are needed when fighting an underground fire. This equipment consists of a complete set of track-laying tools, axes, hammers, copper hammers, set of timberman's tools, saws, 10 pounds of assorted nails, including copper nails, complete set of splints, first-aid supplies, and stretcher. This material is neatly packed in lockers underneath seats that are placed along the sides of the car. The cars are so constructed that a stretcher can be suspended on strong springs, which permit an injured man to be transported comfortably.

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Fire drills are held underground whenever they are held on the surface. When the fire alarm is sounded on top, the cars of coal are immediately taken off the cages and preparations made for the prompt removal of the men from the mine, if necessary. Each man on the shaft bottom has his particular duty to perform. A certain hose or fire extinguisher is assigned him, to which he proceeds at the time the alarm is sounded. The cager remains at his post at the bell until notified that the fire has been extinguished or the fire drill is over. The men underground soon become proficient in their drills and in a very short time will have the hose lines laid out and fire extinguishers ready for action.

A regularly trained first-aid and mine-rescue team is maintained on both the day and night shifts. When a fire alarm is sounded the teams are notified as quickly as possible. They proceed to the mine-rescue station, assemble and test their apparatus, procure other necessary supplies and equipment, and are ready to enter the mine in a very short time. The mine-rescue teams have done very effective and commendable work at mine fires and explosions in their own properties, as well as responding to calls from the State Department and rendering assistance at mines of other companies where they have needed help of this kind. There are few if any other coal companies that maintain a regular first-aid and mine-rescue team on the night shift. The value of organization and a team on the night shift was demonstrated at Mine No. 12 when on February 1, 1929, at about 7 p.m. a fire was discovered in the mine by one of the night shift men, who immediately notified the night boss. The night boss notified the mine officials and safety engineer, after which he started his organization fighting the fire until assistance arrived. When the safety engineer, who is in charge of the mine-rescue work, arrived at the mine, he proceeded to the mine-rescue station to get the necessary equipment, but found that all of the equipment had been taken into the mine by the night force. As the safety engineer proceeded into the mine he found men stationed at the following places: one at the office telephone, one at the ground landing of the main shaft, one at the shaft bottom, one at a telephone at an inside parting and another at a fresh-air base, which had been established on the outby side of the fire area. These men had been instructed to inform the forces of the day shift how to proceed in safety to the fire area. When the safety engineer and his forces arrived in the fire area, the night shift was making very good progress in fighting the fire.

The handling of mine fires and explosions comes under the supervision of the safety department, which is a separate department just like the electrical or operating department, and is under direct supervision of H. T. Bannister, general safety director, at Edwardsville, Ill. The safety department has a corps of mining engineers and practical men who make regular inspections of fire fighting equipment and safety conditions about each mine. The department, in cooperation with the higher officials and the mine officials, formulates the rules for handling fires and explosions, as well as general safety rules which are applicable in the daily operation of the mine.

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The following is a copy of their general rules for handling mine fires.

1. Whenever a fire occurs that can not be quickly extinguished, notify the General Safety Inspector and General Superintendent's office by wire or phone.

2. When necessary to seal off a fire, disconnect the track and take up the rails where seals are to be placed, and for a distance of not less than one rail length back of same. Cut all electric wires of every description, both negative and positive, and bend them back for a distance of not less than 15 feet. If there are any pipe lines leading into the place, remove one (1) length of pipe where the seal is built.

3. The fire should, as a general rule, be sealed in the intake airway first.

4. When ready to open a fire seal, notify the General Safety Inspector, so that he or his assistant may be there to supervise the work.

5. There must be no men permitted in the mine when opening a fire territory, with the exception of those actually required to handle the work, and all of them should be searched for matches, pipes, open lights, etc., before being permitted to enter. The electric cap lamps, flash lights, and other electric lamps provided for safety work must be used, together with such safety lamps for gas testing purposes as the Safety Inspector may deem necessary.

6. The electric current must be cut off of the mine when opening a fire territory and the switches locked open both on the main switchboard in the generator room and at the bottom of the shaft.

7. As a general rule the return airway should be opened first, allowing the helmet men to enter and make their inspection. If no fire is found the brattice on the return should be completely torn out and the intake airway then opened, thus keeping the men in the fresh air at all times. The air should be followed and tested to see that the gas is properly diluted and driven out of the mine before anyone else is allowed to enter.

The Madison Coal Corporation realizes that it is impossible to get efficiency from equipment without trained men. About 20 per cent of its employees have received mine-rescue training. The company was the first to start first-aid training on a large scale, and its Mine No. 9 was the first to get a 100 per cent training certificate. At present the company is operating four mines, three of which have received 100 per cent first-aid training certificates; the other mine has about 95 per cent of its employees trained in first aid.

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The company has always been anxious to take advantage of new and progressive methods in fire fighting equipment and organization. Recently the United States Bureau of Mines started to teach a course which is termed "The Advanced Course in Mine Rescue and Recovery Operations at Mine Fires and Explosions." This course takes up in detail the organization, equipment, and methods of fighting mine fires and carrying on recovery work after explosions, and requires about five 8-hour days to complete it. The company immediately saw the value of the course and made arrangements to have it given at its mines. To date the mine-rescue teams, safety department, engineering corps, all of the mine officials, and many other employees have received the course at least once, and a number of them have taken it two or three times.

The Madison Coal Corporation has also taken a very active interest in methods of promoting safety; as a result they have done exceptionally well toward supporting the International-Mine Rescue and First Aid Contests, and generally have one or two teams attending these contests. The positions of the company's teams at International meets indicate that the teams are so trained that they are able to maintain the high standard of the company. They have received the following prizes at International Mine-Rescue and First-Aid Contests, since 1926.

1926.	International	- First place in mine rescue.
	State	- Do.
1927.	State	- Do.
	State	- First place in first aid.
1928.	International	- Second place in combination first-aid and mine-rescue.
	International	- Second place in mine rescue.
	State	- First place in mine rescue.
1929.	International	- Second place in combination first-aid and mine-rescue.
	International	- Third place in mine rescue.
	State	- First place in mine rescue.

The prizes of 1926-27-28, were won by the company's team at Carterville, Ill., and those of 1929 by the team at Mt. Olive, Ill.

Such an organization as herein described is injury-preventing as well as life-saving, and is also a guarantee of maximum reliability in working time.

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